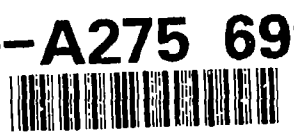

LIFE CYCLE COST ESTIMATE FOR THE SHORT RANGE ANTITANK WEAPON (SRAW)

ANALYSIS SUPPORT BRANCH
(CODE PSA)
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LIFE CYCLE COST ESTIMATE FOR THE USMC SHORT RANGE ANTITANK WEAPON (SRAW)

Theme: The comparison of an independent cost assessment based on parametric analysis to a life cycle cost estimate that employed an analogous estimating methodology.

The original estimate was accomplished by the USMC Analysis Support Branch, MARCORSYSCOM using a Cost and Work Breakdown Structure format. Many of the estimated costs were based on an analogous antitank missile system in conjunction with the Learning Curve Theory. Upon completion, the estimate was forwarded to the Naval Center for Cost Analysis (NCA).

At NCA, an independent cost assessment was performed using parametric analysis based upon previous antitank missile programs. Once completed, the two organizations compared estimates and methodologies. Key differences were found in learning curve assumptions and cost savings due to production line automation.

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The purpose of this Life Cycle Cost Estimate (LCCE) is to identify the life cycle costs associated with the Research, Development, Test and Evaluation (RDT&E); Procurement; and Operations and Support (O&S) of the Short Range Antitank Weapon (SRAW).

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EXECUTIVE SUMMARY

The Short Range Antitank Weapon (SRAW) is a short range, man-portable, fire and forget weapon system capable of defeating present and future, reactive armor equipped main battle tanks. The system is capable of being fired from any terrain, built up areas and enclosed areas. After firing, the expended launcher tube is discarded.

Initial Operating Capability (IOC) is planned for FY98 and Full Operating Capability (FOC) is planned for FY03. The service life of SRAW is anticipated to be ten years after which it is expected to be replaced as a result of technical obsolescence.

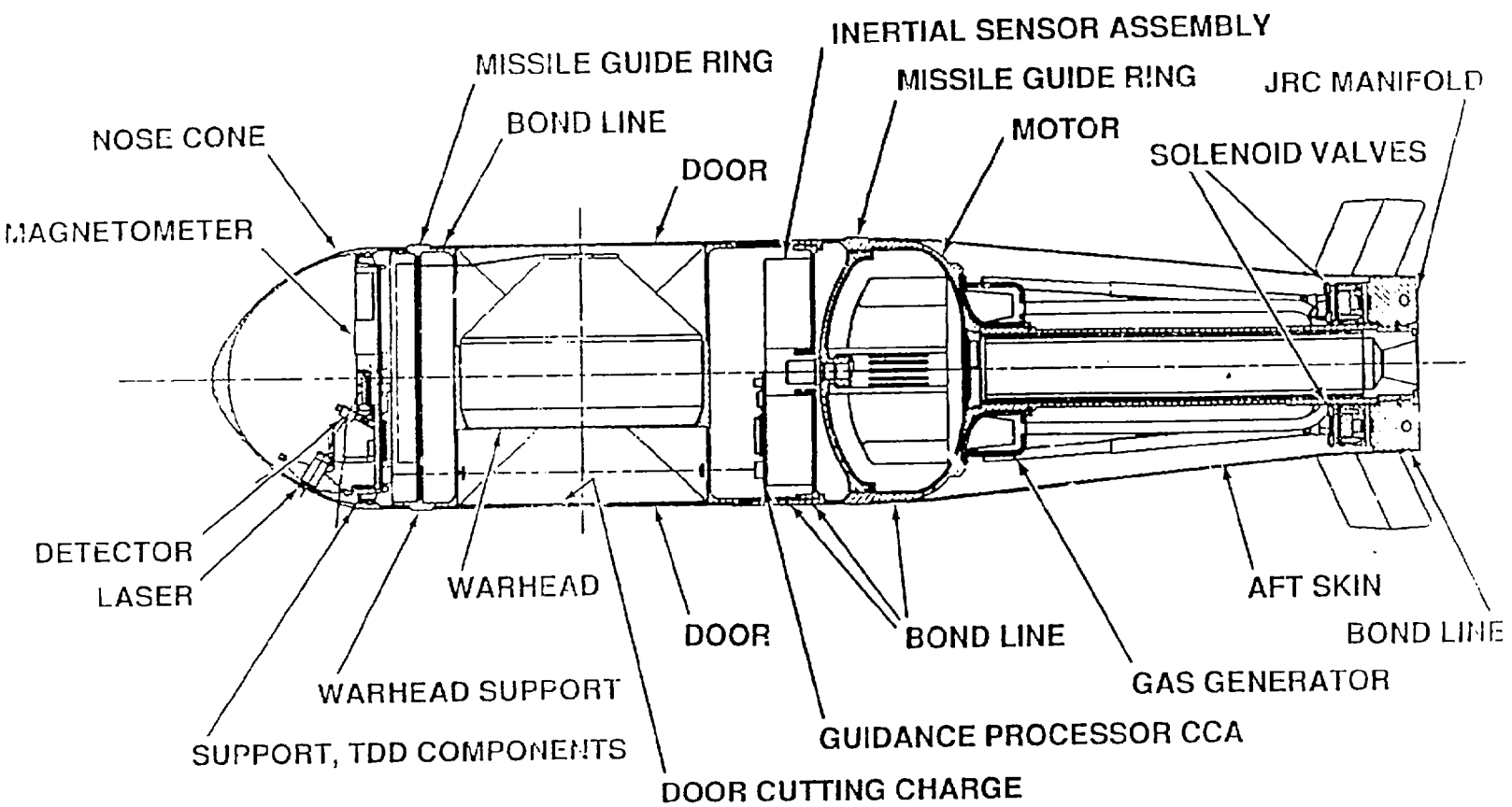
SRAW will not change manpower requirements for the Marine Corps.

The Life Cycle Cost Estimate (LCCE) for the SRAW is $676,809,000 (FY93 Constant Budget Dollars (FY93 CB$)). The sunk costs are not included in this LCCE.

APPROPRIATION	COST
Research, Development, Test and Evaluation (RDT&E)	$ 80,892,000
End Item Procurement, Marine Corps (PMC)	$592,948,000
Support Operations and Maintenance, Marine Corps (O&MMC)	$ 2,969,000
Total	$676,809,000

Based on the estimated costs and in accordance with criteria established by Department of Defense (DoD) Instruction 5000.2, dated 23 February 1991, the SRAW is expected to be an Acquisition Category (ACAT) III program.

TACTICAL MISSILE DESIGN



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1.02 Producibility, Engineering and Planning (PEP)
1.03 Tooling
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1.05 Data
1.06 System Test and Evaluation
1.07 System/Project Management
1.08 Training
1.09 Facilities
1.10 Other

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LIFE CYCLE COST ESTIMATE
FOR THE
Short Range Antitank Weapon (SRAW)

BACKGROUND

INTRODUCTION.

The Short Range Antitank Weapon (SRAW) is a short range, man portable, fire and forget weapon system capable of defeating prese t and future, reactive armor equipped main battle tanks. The system is capable of being fired from any terrain, to include built up areas and enclosed areas. After firing, the expended launcher tube is discarded.

The weapon employs a top-down attack profile which enables SRAW to avoid reactive armor and improve penetration. The missile flight profile causes the missile to climb to a height of nine meters. The resulting high angle allows the warhead to explode downward through the relatively thin-skinned turret top or engine compartment.

PROGRAM HISTORY.

The Balanced Technology Initiative (BTI) Program was mandated by Congress to address deficiencies in armor and antiarmor technologies. In January 1989, the Director of the BTI Program, with the concurrence of Defense Advanced Research Projects Agency (DARPA) and the Marine Corps Research, Development and Acquisition Command (MCRDAC) (now Marine Corps Systems Command), elected to fund five contractors for the next generation man-portable anti-armor weapon system. The charter was to explore both direct attack and top-down attack technologies.

On 14 July 1989, program responsilibity was transferred to MCRDAC. After a six month Concept Exploration and Definition phase was completed in November 1989, a technical evaluation was conducted and two approaches were forwarded: One direct attack and one top-down attack application. In December 1990, the contract for the direct attack approach effort was canceled for the convenience of the government. The remaining contract, with Loral Aeronutronics, is for a top-down attack profile weapon. SRAW will be presented for a MS II Marine Corps Program Decision Meeting (MCPDM) in First Quarter, FY94.

SYSTEM DESCRIPTION.

SRAW is intended to replace the AT-4 as the Marine Corps' short range antiarmor defense weapon. SRAW will have an effective range from 17 meters to 500 meters. The requirement is for a complete weapon system that does not exceed 20.0 pounds, and is not more than 40.0 inches long in its carrying

configuration. The time required to prepare the missile for firing may not exceed one minute.

To employ the weapon, the gunner is required to depress the trigger partway and track an enemy tank for at least one second. A built-in movement rate sensor calculates target rate of speed during tracking and sends that calculation to the on-board computer. The computer utilizes this information to calculate a firing solution. When the trigger is fully depressed and the missile is launched, a rocket motor and four guidance jets maneuver the missile to the estimated location of the target and to a position three meters above the tank. A built-in magnometer senses the metal mass of the enemy vehicle, signaling the warhead to fire. The warhead detonates and propels fragments through the top of the hull.

(Source: Integrated Logistics Support Plan for the Short Range Antitank Weapon (Draft); Acquisition Program Baseline Agreement for the SRAW (Draft))

ASSUMPTIONS AND PARAMETERS.

1. SRAW consists of a missile sealed inside a disposable launcher tube. No maintenance or preservation procedures are required outside of existing climate controlled ammunition storage facilities.

2. Initial Operating Capability (IOC) is planned for FY98 and Full Operating Capability (FOC) is planned for FY03.

3. The service life of SRAW is anticipated to be ten years after which it is expected to be replaced as a result of technical obsolescence. The shelf life is expected to be greater than ten years.

4. SRAW will not change manpower requirements for the Marine Corps.

5. All subtotals have been rounded to the nearest thousand dollars.

6. All costs in this LCCE are presented in FY93 Constant Budget Dollars (FY93 CB$) unless otherwise noted.

(Source: SRAW Project Officer; Integrated Logistics Support Plan for the Short Range Antitank Weapon (Draft))

PHASE: RDT&E PHASE.

1.0 Research and Development. Since program initiation in FY89, funding for the SRAW program has been provided by the BTI office ($40,523,000) and the Marine Corps ($9,500,000). Expended funds are considered as "sunk" costs.

Pending a MS II decision, SRAW will continue into a Engineering and Manufacturing Development (EMD) phase. The Naval Surface Warfare Center (NSWC), Dahlgren, VA has recently completed a cost estimate for the EMD phase, included in Cost Element 1.10 Other.

The NSWC estimate did not include the cost of facilities. That cost was estimated by the cost engineers at Loral and included in Cost Breakdown Structure (CBS) 1.09.

Table 1 displays the RDT&E cost for the EMD phase by fiscal year. The Total RDT&E Cost for the SRAW program is estimated to be **$80,892,000** [Facilities (3,649,000) + Other (77,243,000)].

TABLE 1: FUNDING PROFILE OF THE EMD PHASE ($000)

	FY93	FY94	FY95	FY96	TOTAL
EMD	12,446	22,815	34,223	11,408	80,892

(Sources: An update of the cost data delivered under the Contract Data Requirements List (CDRL) B024 for the Full Scale Development (FSD) Contract for the SRAW program dated 25 August 1992; The Independent Government Cost Estimate for the SRAW Engineering and Manufacturing Development (EMD) Contract dated 22 October 1992)

1.01 Development Engineering. Included in 1.10 Other.

1.02 Producibility, Engineering and Planning (PEP). Included in 1.10 Other.

1.03 Tooling. Included in 1.10 Other.

1.04 Prototype Manufacturing. Included in 1.10 Other.

1.05 Data. Included in 1.10 Other.

1.06 System Test and Evaluation. Included in 1.10 Other.

1.07 System/Project Management. Included in 1.10 Other.

1.08 Training. Included in 1.10 Other.

1.09 Facilities. Loral has purchased a production facility in Camden, AR from LTV Corp. and it is expected the production of missiles will be moved to these facilities after EMD. To prepare the facilities for LRIP and FSP operations, these facilities will have to be refurbished during the EMD phase. The cost of reconfiguring/refurbishing these facilities is based on the function of a particular building and the square footage. For SRAW, there are three types of facilities: 1) assembly; 2) non-hazardous material storage and offices and 3) explosive material, rocket motor and finished missile storage. The estimated cost of

reconfiguring/refurbishing the anticipated floor space requirement is presented in Table 2.

The cost of operating production facilities consists of individual charges for utilities, security and maintenance. Cost is dependent on the function of the building and size (see Table 3).

The Total Facility Cost during the EMD Phase is estimated to be **$3,648,760** [The One-Time Cost of Reconfiguring/Refurbishing the Facility ($1,039,000) + (The Annual Cost of Facilities ($652,440) * Length of the EMD Phase (4 Years))].

TABLE 2: RECONFIGURING/REFURBISHING FACILITIES COST

Storage Function	Square Footage	Refurbishing Cost Per Square Foot	Cost Per Type of Facility
Assembly	4,000	150	600,000
Storage/Office	600	100	60,000
Explosive Material	3,790	100	379,000
Total			1,039,000

TABLE 3: ANNUAL FACILITIES CHARGE

Storage Function	Square Footage	Annual Cost Per Square Foot	Annual Cost Per Type of Facility
Assembly	4,000	120	480,000
Storage/Office	600	60	36,000
Explosive Material	3,790	36	136,440
Total			652,440

1.10 Other. This category contains program costs that could not be included in the previous CBS elements. Currently, NSWC provides engineering and contracting support for the program. As mentioned previously, NSWC has completed a cost estimate for the SRAW EMD phase (included in Appendix A). The estimate was done in terms of engineering and manufacturing labor hours and materials. It could not be separated into a CBS format. After the cost of money, General & Administrative (G&A) and Fee have been added, EMD costs are estimated to be **$77,242,914** (see Table 4).

TABLE 4: EMD COST ESTIMATE

EMD Estimate		Cost of Money (1%)		G&A (14%)		Fee (7%)		Total
63,313,864	+	633,139	+	8,863,941	+	4,431,970	=	$77,242,914

PHASE: INVESTMENT.

After SRAW completes the EMD phase, the project officer will seek a MS IIIA decision to conduct a Low Rate Initial Production (LRIP). This phase will extend from FY96 through FY98 and have a production run of 2000 missiles. Upon LRIP completion, the project officer will request a MS III decision to commence the Production and Deployment (P&D) Phase. Based on an Acquisition Objective (AO) established by the Marine Corps Combat Development Command (MCCDC), the Marine Corps is planning to acquire 50,061 missiles. Taking into account that 2000 missiles will be produced during the LRIP, a missile production consisting of 8,010 units/year starting in FY98 and continuing through FY03 will meet the remaining AO (48,061). Based on the AO and the costs estimated in the elements of the CBS below, the Total Investment in the SRAW Program is anticipated to be **$592,902,000** [PMC Costs for LRIP Phase ($56,306,828) + PMC Costs for P&D Phase ($536,595,295)].

Tables 5 and 6 display the funding profile for the Procurement, Marine Corps (PMC) funding for the LRIP and P&D phases by fiscal year.

TABLE 5: FUNDING PROFILE OF THE LRIP ($000)

	FY96	FY97	FY98	TOTAL
LRIP	21,960	28,154	6,193	56,307

TABLE 6: FUNDING PROFILE OF THE PRODUCTION AND DEPLOYMENT PHASE ($000)

	FY98	FY99	OUTYEARS [1]	TOTAL
P&D	93,160	93,160	350,275	536,595

[1] Beyond the last year of the Future Years Defense Plan (FYDP) (i.e., FY99), funding is summed up in the Outyears column.

(Sources: An update of the cost data delivered under the Contract Data Requirements List (CDRL) B024 for the Full Scale Development (FSD) Contract for the SRAW program dated 25 August 1992; Mr. Bill Logan, Traffic Management Office (LFT), HQ Marine Corps)

2.1 **LRIP**. The Total Cost for LRIP is estimated to be **$56,306,828** [Cost of Non-recurring Investment (6,499,228) + Cost of Production ($41,930,572) + Cost of System/Project Management ($7,877,028)].

2.101 Non-recurring Investment. During the EMD phase, initial tooling will take place in order to produce 250 prototype missiles. That cost is included in the NSWC' EMD estimate (see 1.10 Other). In the LRIP phase, it has been estimated that $798,151 will be required to move Camden, AR and expand the production line and refurbish existing equipment. The expanded production capacity will facilitate the production of 2000 missiles during LRIP.

As prime contractor of this development, Loral is expected to use subcontractors to provide various components needed for the missile system. To partially cover the costs of developing and maintaining their production facilities during LRIP, Loral has estimated that $5,701,077 will be required to be paid to subcontractors to maintain their participation in the program.

The Total Non-recurring Investment Cost for LRIP is estimated to be **$6,499,228** [The Cost of Expanding/Refurbishing the Production Line ($798,151) + Subcontractor Non-recurring Costs ($5,701,077)]

2.102 Production. The cost of Producibility, Engineering and Planning (PEP) represents the expenditures incurred while designing the missile system and conducting the producibility analyses necessary to mass-produce the weapon. It is estimated that it will cost $1,012,761.

To determine the cost of the LRIP missiles, a cost for Theoretical First Unit (TFU) for LRIP must be calculated. It was determined that if the cost for the TFU for EMD could be calculated, that a step-down could be applied to ascertain the THU for LRIP. Based upon the Navy's estimate that the first 250 missiles would cost $25,700,000, an average unit cost (AUC) for the EMD missiles would be $102,800 ($25.7M/250 Missiles). Due to constant change in design and construction expected during the EMD Phase, it is anticipated that very little productive learning will occur. Therefore, a cumulated average cost factor for a 93% learning curve is used along with the AUC to determine the TFU cost for EMD.

EMD TFU Cost = AUC EMD Missiles / Cumulative Average Cost Factor
= $102,800 / 0.71672
= $143,431

The step-down factor that is applied to compute the LRIP TFU from the EMD TFU is estimated to be 50%.

LRIP TFU Cost = EMD TFU Cost * Step-Down Factor
= 143,431 * .50
= 71,716

The cost of the 2000 missiles produced during LRIP can be computed based upon a LRIP TFU cost of $71,716 (FY92 CB$) and an anticipated LRIP learning curve of 85%. Using these values, the cumulative average cost (CAC) for the missiles will be $15,739 (FY92 CB$) [LRIP TFU Cost ($71,716) * Cumulative Average Unit Cost Factor for 85% and 2000 Units Produced (0.21946)[2]]. After the average cost is escalated to FY93 dollars and G&A and Fee are added in, the Total Cost of LRIP for the SRAW Program is anticipated to be $40,917,811 (see Table 7).

[2] Since the EMD missiles will be produced using different facilities and personnel, the first LRIP missile is considered the first unit on the curve, not the 251th.

The Total Cost of Production during LRIP is estimated to be **$41,930,572** [Cost of PEP ($1,012,761) + Cost of Producing the LRIP Missiles ($40,917,811).

TABLE 7: LRIP COST

Quantity of Missiles		CAC Estimate (FY92 CB$)		Escalation Factor		Total Cumulative Cost for the 2000 Missiles (FY93 CB$)
2000	*	15,739	/	0.9647	=	32,629,833

Total Cumulative Cost for the 2000 Missiles (FY93 CB$)		G&A (14%)		Fee (10%)		Total Cost of the LRIP Missiles (FY93 CB$)
$32,629,833	+	4,568,177	+	3,719,801	=	40,917,811

2.103 Engineering Changes. Not Applicable.

2.104 System Test and Evaluation. Not Applicable.

2.105 Data. Not Applicable.

2.106 System/Project Management. It is estimated the cost of planning, organizing, and directing the LRIP is **$7,877,028.**

(Source: An update of the cost data delivered under the Contract Data Requirements List (CDRL) B024 for the Full Scale Development (FSD) Contract for the SRAW program dated 25 August 1992)

2.107 Operational/Site Activation. Not Applicable.

2.108 Training. Not Applicable.

2.109 Initial Spares and Repair Parts. Not Applicable.

2.110 Transportation. Not Applicable.

2.112 Other. Not Applicable.

2.2 Full Scale Production (FSP). The costs for producing the 48,061 missiles over the six year production run are displayed in Table 8 by CBS. The Total Cost for FSP is estimated to be **$536,595,295.**

TABLE 8: THE COST OF FSP

CBS		Cost (FY93 CB$)
2.201	Non-recurring Investment	6,499,228
2.202	Production	524,348,990
2.203	Engineering Changes	0
2.204	System Test and Evaluation	0
2.205	Data	0
2.206	System/Project Mgmt	5,701,077
2.207	Operational/Site Activation	0
2.208	Training	0
2.209	Initial Spares and Repair Parts	0
2.210	Transportation	46,000
2.211	Other	0
Total		536,595,295

2.201 Non-recurring Investment. For the FSP, Loral has estimated that it will cost approximately the same as during LRIP to maintain and increase the production line size ($798,151) and defer part of the subcontractors' nonrecurring costs ($5,701,077). The Total Non-recurring Investment Cost is estimated to be **$6,499,228** [The Cost of Maintaining the Production Line During FSP ($798,151) + Subcontractor Non-recurring Costs During FSP ($5,701,077)].

2.202 Production. During FSP, the PEP efforts will be toward Quality Assurance (QA) issues and engineering problems encountered while increasing the production rate by a magnitude of 10. This cost is estimated to be **$1,012,761.**

The Average Unit Price for the SRAW is estimated to be **$10,889** (FY93 CB$) (see Table 9). The Total Cost of Production is estimated to be **$524,348,990** [The Cost of PEP During FSP ($1,012,761) + The Cost of FSP Missiles (523,336,229) ((Unit Cost ($10,889) * Acquisition Objective (48,061))].

TABLE 9: AVERAGE UNIT PRICE FOR THE SRAW MISSILE

WBS	Cost (FY93 CB$)
Prime Mission Equipment-Complete Round	9,359
Prime Mission Equipment - Launcher	451
Fee (11% of the Cost of the Above Items)	1,079
Total	10,889

2.2021 Prime Mission Equipment - Complete Round. After LRIP is complete and the decision is made to produce the final 48,061 missiles, the production line will be expanded and automated to a higher degree to increase the production capacity. It is expected the increase automation will flatten the learning curve, decreasing the percentage of learning from 85% to 93% (learning per unit decreases as the percentile increases). The 93% factor is the average of the production curves of other anti-armor missile programs (e.g. AT-4 (94%) and the TOW 2B (93%)).

To calculate the cost of the missiles, it is necessary to compute an AUC for the FSP missiles based on a 93% learning curve. To do this, a TFU for FSP and the Algebraic Lot Midpoint (ALM) must be determined first. The FSP TFU can be calculated from the cost of the 2001st missile on the 85% learning curve and moving back up a 93% learning curve. The Learning Curve Equation is as follows:

$$Y = AX^{B}$$

The ith Unit Cost = TFU (The ith Unit Number) $^{\text{Learning Curve Exponent}}$

Using the 2001th missile cost ($12,066) and a B value for a 93% learning curve (-0.1047), solving for A gives:

$$A = Y/X^{B}$$

$$A = \$12,066 \; / \; 2001^{-0.1047}$$

$$A = 26,743$$

To calculate the ALM for the 48,061 missiles, the following formula is required:

$$K = \left[\frac{(L-F+1)\ (1+B)}{(L+.5)^{1+B} - (F-.5)^{1+B}} \right]^{-1/B}$$

L = Number of last unit (50,061)
F = Number of first unit (2001)
B = Learning curve exponent for a 93% curve (-0.1047)

K = 20,657th Unit

To find the cost of production unit that has the equivalent cost to the AUC of the FSP lot, the first 2000 units are added to FSP ALM (20,657), which totals to 22,657. It is expected the cost of the 22,657th unit on the 93% learning curve is $9,359, which is equal the AUC of the FSP lot. The Cost of the Complete Round during Full Scale Production is estimated to be **$9,359**.

$$Y = AX^B$$

$$Y = (26,743)(22,657)^{-0.1047}$$

$$Y = \$9,359$$

(Sources: Business Clearance Memorandum, HQ US Army Armament, Munitions and Chemical Command (AMCCOM), dated 19 February, 1992; Mark Sweeney, TOW Project Office)

2.2022 Prime Mission Equipment - Launcher. The SRAW launcher acts as a carrying case and sealed storage container for the missile. Launcher components that serve as part of the carrying case are the tube, end caps, shock isolators, sling and handle. The tube holds the trigger mechanism, sight, and a battery. This battery will power the rate sensor during the tracking sequence. It will be of a design not requiring periodic replacement during storage (e.g. chemical or water activated). The cost for these components has been estimated to be **$451** per missile.

(Source: Full Scale Development (FSD) Contract for the SRAW program, N60921-89-C-A136)

2.203 Engineering Changes. Not Applicable.

2.204 System Test and Evaluation. Not Applicable.

2.205 Data. Not Applicable.

2.206 System/Project Management. The estimated cost of planning, organizing, and directing the program during FSP is **$5,701,077.**

(Source: An update of the cost data delivered under the Contract Data Requirements List (CDRL) B024 for the Full Scale Development (FSD) Contract for the SRAW program dated 25 August 1992)

2.207 Operational/Site Activation. Not Applicable.

2.208 Training. No training devices will be acquired for the SRAW program. Training ammunition will come from the 50,061 missile procurement.

(Source: SRAW Project Officer)

2.209 Initial Spares and Repair Parts. The SRAW missile is a disposable round and will not require spare or repair parts.

2.210 Transportation. First Destination Transportation (FDT) from the Camden, AR to the storage facility at Crane, IN will cost an estimated **$46,000.**

(Source: Mr. Bill Logan, Traffic Management Office (LFT), HQ Marine Corps)

2.211 Other. Not Applicable.

PHASE: OPERATING AND SUPPORT (O&S). The SRAW missile is sealed within its launcher tube and does not require any periodic testing or maintenance of any kind and is considered a "wooden round". The only O&S costs incurred by the missile are for Second Destination Transportation (SDT) and storage. The Total O&S Cost for the SRAW program is estimated to be **$2,790,000** [SDT Costs for SRAW ($338,000) + Storage ($2,451,977)].

TABLE 10: FUNDING PROFILE OF THE O&S PHASE

	FY98	FY99	OUTYEARS	TOTAL
SDT	54,082	54,082	229,836	338,000
Storage	49,249	95,715	2,307,013	2,451,977
Total	103,331	149,797	2,536,849	2,789,977

(Sources: SRAW Project Officer; Integrated Logistics Support Plan for the Short Range Antitank Weapon (Draft))

3.1 Military Personnel. Not Applicable.

3.2 Consumption. Not Applicable.

3.3 Depot Maintenance. Not Applicable.

3.4 Modification, Material. Not Applicable.

3.5 Other Direct Support Operation. Not Applicable.

3.51 Second Destination Transportation (SDT) Costs. SRAW missiles will primarily be stored at the Naval Weapons Support Center, Crane, IN. However, 2,900 missiles will be transported annually to unit locations for use as training rounds for the Active and Reserve forces. It is expected the Reserves will use the same facilities as the Active Forces. Second Destination Transportation (SDT) costs for shipments from the storage facility at Crane, IN to unit locations are displayed in Table 11. SDT will cost an estimated **$338,000.**

TABLE 11: SDT COSTS

Destination	Transportation Cost
Camp Lejeune	10,000
Camp Pendleton	29,000
MCAS Kaneohe	126,000
Camp Butler	173,000
Total	338,000

(Source: Mr. Bill Logan, Traffic Management Office (LFT), HQ Marine Corps)

3.52 Other Direct. As stated in para. 3.51, the missiles will be stored at Crane, IN and be attrited as they are used as training rounds. The storage costs peak from FY98 to FY03 and decline to the end of the project life in FY13. The Total Cost for Storage is estimated to be **$2,451,977** (see Table 12).

TABLE 12: STORAGE COSTS

Fiscal Year	Number of Missiles Stored	Annual Cost (FY93 CB$)
FY98	7,861	49,249
FY99	15,278	95,715
FY00	22,282	139,282
FY01	28,664	179,578
FY02	34,691	217,336
FY03	40,196	251,825
FY04	37,296	233,656
FY05	34,396	215,488
FY06	31,496	197,320
FY07	28,596	179,152
FY08	25,696	160,983
FY09	22,796	142,815
FY10	19,896	124,647
FY11	16,996	106,479
FY12	14,096	88,310
FY13	11,196	70,142
Total		2,451,977

(Source: Gale Grow, Director of the Marine Corps Storage Division, (Code 403), Naval Weapons Support Center, Crane, IN)

3.6 Indirect Support Operations. Not Applicable.

PHASE: DISPOSAL. After the anticipated ten year life has expired, the missiles are expected to be disposed of through a Foreign Military Sales (FMS) program. Only the costs of packaging and transportation are expected to be reimbursed from the sale.

(Source: SRAW Project Officer)

Program Risk.

Technical Risk. The technical risk for the SRAW program is assessed as low. A known technology is being used and successful test flights have already been conducted. The technology involved has been successfully used in the TOW 2B missile and is being used in the Javelin missile development. When Javelin and SRAW are fielded, the Department of Defense will have a top-down attack antiarmor missile in all three antiarmor classes.

Programmatic Risk. The risk that program costs will increase significantly is consider to be low. The production learning curve, a critical cost driver, compares quite closely to learning curves of other anti-armor missile programs (e.g. AT-4 (94%) and the TOW 2B (93%)). A more likely possibility is the cost of the program will decrease if another service (i.e., the Army) or foreign government buys into the program. Some of the development and fixed costs of production could be recouped on a per missile basis.

REFERENCES

Major T.A. Young, SRAW Project Officer, Ground Weapons, (CBG), MARCORSYSCOM, (Comm) (703) 640-2006, (DSN) 278-2006.

Mr. M.W. Block, Naval Surface Warfare Center, Dahlgren, VA, (Comm) 703-663-8891, (DSN) 249-8891).

The Independent Government Cost Estimate for the SRAW Engineering and Manufacturing Development (EMD) Contract, dated 22 October 1992, Naval Surface Warfare Center.

Integrated Logistics Support Plan for the Short Range Antitank Weapon (Draft).

Mr. B.Logan, Traffic Management Office (LFT), HQ Marine Corps, (Comm) 703-696-0855.

Business Clearance Memorandum, HQ US Army Armament, Munition and Chemical Command (AMCCOM), dated 19 February, 1992.

Then Year Dollars to FY93 Constant Budget Dollars Escalation Factors.

Mr. M. Sweeney, TOW Project Office, Program Management Division, Land Combat Systems, Redstone Arsenal, Huntsville, AL, (DSN) 746-4951.

Mr. G. Grow, Director of the Marine Corps Storage Division, (Code 403), Naval Surface Warfare Center, Crane, IN, (DSN) 482-5425.

Full Scale Development (FSD) Contract for the SRAW program, N60921-89-C-A136.

Acquisition Program Baseline Agreement for the SRAW (Draft)

Mr. R.E. Albright, Senior Programmer/Analyst, Loral Aeronutronic, Newport Beach, CA, (Comm) 714-720-4588.

Mr. R.A. Maxwell, Senior Programmer/Analyst, Loral Aeronutronic, Newport Beach, CA, (Comm) 714-720-4588.

GLOSSARY

AUC - Average Unit Cost
BIT - Balanced Technology Initiative
CBS - Cost Breakdown Structure
EMD - Engineering and Manufacturing Development
FOC - Full Operational Capability
IOC - Initial Operational Capability
LCCE - Life Cycle Cost Estimate
LRIP - Low Rate Initial Production
O&S - Operations & Support
RDT&E - Research, Development, Test and Evaluation
TFU - Theoretical First Unit
WBS - Work Breakdown Structure

MEMORANDUM

From : G31 (Block)
To : S115 (Jones)

Subj : INDEPENDENT GOVERNMENT COST ESTIMATE FOR THE SRAW ENGINEERING AND MANUFACTURING DEVELOPMENT (EMD) CONTRACT.

Enclosure (1) : SRAW EMD ICE.

1. Enclosure (1) is provided as the governments independent cost estimate of the necessary labor and materials for the SRAW EMD program.

2. The SRAW program is currently completing a Demonstration / Validation program. The prime contractor is Loral Aeronutronic. The cost plus fixed fee contract number is N60921-89-C-A136. The effort performed under this contract will serve as the basis of the subject estimate. The application of this for estimating purposes is described below.

3. The base values used from the current contract are primarily actual costs incurred from 2/90 through the 8/92 period of performance. This 30 month period is considered an excellent basis from which to project the SRAW EMD estimate. The nature of the work is identical, as is the contractor. The D/V was a period of design, development, manufacture and test as is the future EMD program. The EMD design is of approximately 40% greater technical scope and is estimated to occur over an approximately 40% longer duration. Both of these increases result from the fact the product of the EMD program is a man-rated production design.

4. The hours and materials costs incurred is inflated for the EMD estimate using the following guidelines:

A. The EMD period is estimated to be 42 months or 40% longer in duration. It will be assumed that the engineering labor categories will need to support the program for 40% longer. The technical scope of the EMD program is considered to be 40% greater and thus a 1.4 scope factor is applied to most categories. Some scope factors are higher, such as "Engineer" to support a more intensive test program and "Draftsmen" for creation of the competitive TDP.

B. The Hardware production cost will be scaled relative to the missile manufacturing requirements. Learning curve consideration will be applied to the EMD hardware manufacturing. In EMD approximately 240 missiles will be produced compared to the 54 units produced during D/V. The general scope of the manufacturing effort is factored at 2.2 that of the D/V. This labor increase is due to the increase in documenting formalized procedures and production methods.

C. The travel scope will be increased as the government will require more of the IPRs to occur on this coast and the EMD test program will require more travel.

Appendix A

EMD estimate

Appendix A

COST CATEGORY	D/V ACTUALS	SCOPE FACTOR	DURATION FACTOR	TOTAL	COSTS USING D/V LABOR
ENGINEERING					
Prog/Tech Management	7,277	1.4	1.4	14,263	
Development Engineer	1,981	1.4	1.4	3,883	
Principal Engineer	22,287	1.4	1.4	43,683	
Senior Engineer	32,060	1.4	1.4	62,838	
Engineer	30,017	4	1.4	188,095	
Junior Engineer	3,587	1.4	1.4	7,031	
Designer Draftsman	10,628	3	1.4	44,638	
Technical Support	11,798	1.4	1.4	23,124	
Planner Scheduler	2,078	2.5	1.4	7,273	
Data Systems	120	1.4	1.4	235	
Contracts	1,419	3	1.4	5,960	
Finance	1,471	3	1.4	6,178	ENGINEERING TOTAL
Total Engineering				387,199	$26,445,719
MANUFACTURING				0	
Mfg Mgmt/Mfg Plans	374	2.2	3	2,468	
Production Control	1,020	1.4	4	5,712	
Manufacturing Engineer	206	2.2	4	1,813	
Quality Control	2,447	2.2	4	21,634	
Purchasing	6,894	2.2	3	45,500	
Mechanical Fab	6,717	2.2	4	59,110	
Mechnaical Assy	316	1.5	4	1,896	
Electrical Fab & Assy	8,469	2.2	4	74,527	
Quality Inspection	2,517	2.2	4	22,150	MANUFACTURING TOTAL
Total Manufacturing				234,710	$10,843,584
					MAT & SUBCONTRACTS
Material and Sub.	$5,197,544	4		$20,790,176	$20,790,176
					OTHER DIRECT COSTS
Travel	$229,868	3		$689,604	$689,604
Technical Publications	$99,426	10		$994,260	$994,260
Computer	$564,658	1.4		$790,521	$790,521
Test ranges	$460,000	2	3	$2,760,000	$2,760,000
			TOTAL	LABOR & MATERIAL	$63,313,864

Major System: Short Range Antitank Weapon

Date: 9-7-93

SUMMARY VERSION LIFE CYCLE COST MODEL (SVLCCM) VER 3.1
PART I of III. -- COST ESTIMATE (EST) (Active and Reserve Forces)
(In Thousands of FY93 Constant Budget Dollars)
(SEPTEMBER 92 Escalators)
10 YEAR LIFE CYCLE

Prepared for:
Org. Code:
Phone:

Prepared by: Ted Kuusisto
Org. Code: PSA
Phone: AV 278-4444

PHASE/CATEGORY		SUBCATEGORY	CATEGORY	PHASE
I. RDT&E PHASE				80,892
II. INVESTMENT PHASE				592,948
A. SYSTEM PRODUCTION/PROCUREMENT			592,948	
1. Major End Item (Contractor)		536,595		
2. Initial Provisioning/Spares, Repair Parts		0		
3. Government Furnished/Added Equipment		0		
4. Other Direct System Costs		56,307		
5. 1st Destination Transportation		46		
B. SUPPORT EQUIPMENT PROCUREMENT			0	
1. Ammunition		0		
2. Weapons and Tracked Combat Vehicles		0		
3. Guided Missles		0		
4. Comm-Elec Equipment		0		
5. Support Vehicles		0		
6. Engineer and Other Equipment		0		
C. SUPPORT PROCUREMENT (Navy Funded)			0	
1. APN		0		
2. WPN		0		
3. OPN		0		
D. MILITARY CONSTRUCTION			0	
III. OPERATIONS AND SUPPORT PHASE				2,969
A. OPERATIONS			338	
1. Operator Personnel		0		
2. Operator Training		0		
3. Material Consumption		0		
4. Training Ammunition		0		
5. Energy Consumption		0		
6. 2nd Destination Transportation		338		
B. MAINTENANCE			0	
1. Organizational Maintenance (OM)		0		
a. OM Personnel	0			
b. OM Training	0			
c. OM Maintenance Material	0			
d. OM Repair Material	0			
e. OM Other	0			
2. Intermediate Maintenance (IM)		0		
a. IM Personnel	0			
b. IM Training	0			
c. IM Maintenance Material	0			
d. IM Repair Material	0			
e. IM Other	0			
3. Depot Repair		0		
4. Depot Overhaul		0		
5. Unprogrammed Losses		0		
6. Software Maintenance		0		
C. INDIRECT SUPT, BASE OPS & MAINT, OTHER O/H COSTS			2,631	
1. Base Operations		2,631		
2. Other Overhead Costs		0		
D. SUPPORT EQUIPMENT O&S			0	
TOTAL LIFE CYCLE COSTS				676,809

Major System: Short Range Antitank Weapon

Date: 9-7-93

SUMMARY VERSION LIFE CYCLE COST MODEL (SVLCCM) VER 3.1
PART II of III. -- FUNDING PROFILE (FP)
(In Thousands of FY93 Constant Budget Dollars)
(SEPTEMBER 92 Escalators)
10 YEAR LIFE CYCLE

Prepared for:
Org. Code:
Phone:

Prepared by: Ted Kuusisto
Org. Code: PSA
Phone: AV 278-4444

CATEGORY	PRIOR YEARS	CURRENT YEAR (92)	BUDGET YEAR (93)	FY94	FY95	FY96	FY97	FY98	FY99	LCCE TOTAL OUTYEAR FUNDING*	PROGRAM COSTS**
RDT&E	0	0	12,446	22,815	34,223	11,408	0	0	0	0	80,892
FYDP Dollars	(	0)(	12,446)(	23,627)(	36,669)(	12,640)(	0)(	0)(	0)		
End Item											
PMC	0	0	0	0	0	21,960	28,154	99,353	93,160	350,321	592,948
FYDP Dollars	(	0)(	0)(	0)(	0)(	24,295)(	32,206)(	117,517)(	113,938)		
QUANTITIES FUNDED:											
Short Range Antitank Weapon	0	0	0	0	0	0	0	8,010	8,010	32,041	48,061
Sppt PMC	0	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	0)(	0)		
MILCON	0	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	0)(	0)		
Sppt OMMC	0	0	0	0	0	0	0	103	150	2,716	2,969
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	124)(	186)		
Sppt OMMCR	0	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	0)(	0)		
MPMC	0	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	0)(	0)		
RPMC	0	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	0)(	0)		
NAVY FUNDS	0	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)(	0)(	0)(	0)(	0)(	0)(	0)(	0)		
TOTAL PROG	0	0	12,446	22,815	34,223	33,368	28,154	99,456	93,310	353,037	676,809
FYDP Dollars	(	0)(	12,446)(	23,627)(	36,669)(	36,935)(	32,206)(	117,640)(	114,124)		

SUMMARY VERSION LIFE CYCLE COST MODEL

PART III of III. -- INPUT DATA REPORT

Short Range Antitank Weapon

Years in Life Cycle: 10
VER 3.1
Run Date: 9-7-93

Prepared by:
Ted Kuusisto
PSA
AV 278-4444

File stored on disk drive and file: C:SHORT

Short Range Antitank Weapon QUANTITIES:

	Pre-1992	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	Outyears
Short Range Antitank Weapon	0	0	0	0	0	0	0	8,010	8,010	32,041

COST ESTIMATE INPUT

All Input based on FY93 dollars.

RDT&E Total Cost:	80,892,000	IN DOLLARS (FY 93)
INVESTMENT PHASE COSTS:		
SYSTEM PRODUCTION PROCUREMENT -		
UNIT PRICE: Short Range Antitank Weapon	11,165	IN DOLLARS (FY 93)
INITIAL PROVISIONING/SPARES/PARTS:	0	IN DOLLARS (FY 93)
GOV'T FURN. MAT'L/EQUIP:	0	IN DOLLARS (FY 93)
OTHER DIRECT SYSTEM COSTS(PMC):	56,306,828	IN DOLLARS (FY 93)
OTHER DIRECT SYSTEM COSTS(O&MMC):	0	IN DOLLARS (FY 93)
1st DESTINATION TRANSPORTATION:	46,000	IN DOLLARS (FY 93)
SUPPORT EQUIPMENT PROCUREMENT -		
AMMUNITION (BA 1):	0	IN DOLLARS (FY 93)
WEAPONS & TRACKED COMBAT VEH. (BA 2):	0	IN DOLLARS (FY 93)
GUIDED MISSLES (BA 3):	0	IN DOLLARS (FY 93)
COMM-ELEC (BA 4):	0	IN DOLLARS (FY 93)
SUPPORT VEHICLES (BA 5):	0	IN DOLLARS (FY 93)
ENGR & OTHER EQUIP (BA 6):	0	IN DOLLARS (FY 93)
NAVY APPROPRIATIONS -		
APN:	0	IN DOLLARS (FY 93)
WPN:	1	IN DOLLARS (FY 93)
OPN:	1	IN DOLLARS (FY 93)
MILCON -	1	IN DOLLARS (FY 93)

OPERATIONS AND SUPPORT PHASE -

Short Range Antitank Weapon

OPERATIONS DATA -

OPERATIONAL END ITEMS:		0	
OPERATING HOURS PER YEAR:		0.00	
OPERATORS are DEDICATED			
Number needed -	E-1 -- E-5:	0.00	
	E-6 -- E-9:	0.00	
	W-1 -- O-3:	0.00	
	O-4 and up:	0.00	
OPERATOR MPMC TRAINING COSTS:		0.00	IN DOLLARS (FY 93)
OPERATOR O&MMC TRAINING COSTS:		0.00	IN DOLLARS (FY 93)
OPERATOR RPMC TRAINING COSTS:		0.00	IN DOLLARS (FY 93)
OPERATOR O&MMCR TRAINING COSTS:		0.00	IN DOLLARS (FY 93)
MATERIAL CONSUMPTION:		0.00	IN DOLLARS (FY 93)
TRAINING AMMO. PER YR:		0.00	IN DOLLARS (FY 93)
ENERGY CONSUMPTION -			
ELECTRICITY (kilowatts/yr)		0.000000	
0.00 % comm'l '100.00 %MEP			
FOSSIL FUEL (gal/yr)		0.00	
FUEL TYPE IS: GASOLINE			
FOSSIL FUEL (gal/yr)		0.00	
FUEL TYPE IS: GASOLINE			
2nd DESTINATION TRANSPORTATION:		338,000.00	IN DOLLARS (FY 93)

ORGANIZATIONAL MAINTENANCE (OM) -

THERE IS NO ORGANIZATIONAL MAINTENANCE FOR THIS SYSTEM

INTERMEDIATE MAINTENANCE (IM) -

THERE IS NO ACTION FOR INTERMEDIATE LEVEL FAILURES FOR THIS SYSTEM.

THERE IS NO INTERMEDIATE LEVEL PREVENTIVE MAINTENANCE FOR THIS SYSTEM.

OTHER IM COSTS PER SYSTEM PER YEAR	0.00	IN DOLLARS (FY 93)

THERE ARE NO DEPOT LEVEL REPAIRS FOR THIS SYSTEM.

THERE ARE NO DEPOT LEVEL OVERHAULS FOR THIS SYSTEM.

UNPROGRAMMED LOSSES: (total)	0.00

THIS SYSTEM DOES NOT REQUIRE SOFTWARE/FIRMWARE MAINTENANCE.

STORAGE INFORMATION:

Number of cubic feet:	4.00

Storage is INSIDE HEATED.

MISCELLANEOUS DIRECT INVESTMENT DATA - Short Range Antitank Weapon

I. RDT&E	0.00
II. Investment	
A. System Procurement	
1. Major End Item	0.00
2. Initial Spares	0.00
3. Government Furn. Equip.	0.00
4. Other Direct System Cost	0.00
5. First Transp Costs	0.00
B. Support Equipment Proc.	
1. Ammunition	0.00
2. Wpns. & Tracked Veh.	0.00
3. Guided Missiles	0.00
4. Comm-Elec Equipment	0.00
5. Support Vehicles	0.00
6. Engineer & Other Equip.	0.00

MISCELLANEOUS DIRECT O&S DATA - Short Range Antitank Weapon

III. Operations & Support	
A. Operations	
1. Operator Personnel	0.00
2. Operator Training	
a. Personnel Costs	0.00
b. Materials Costs	0.00
3. Material Consumption	0.00
4. Training Ammunition	0.00
5. Energy Consumption	0.00
6. Second Transp Costs	0.00
B. Maintenance	
1. Organizational Maint.	
a. ON Personnel	0.00
b. ON Training	
Personnel Costs	0.00
Materials Costs	0.00
c. ON Maint. Material	0.00
d. ON Repair Material	0.00
e. ON Other	0.00
2. Intermediate Maint.	
a. IN Personnel	0.00
b. IN Training	
Personnel Costs	0.00
Materials Costs	0.00
c. IN Maint. Material	0.00
d. IN Repair Material	0.00
e. IN Other	0.00
3. Depot Repair	0.00
4. Depot Overhaul	0.00
5. Unprogrammed Losses	0.00
6. Software Maint	
Military	0.00
Civilian	0.00
C. Indirect Costs	
1. Base Operations	2,451,977.00
2. Other Overhead Costs	0.00
D. Support Equipment O&S	
1. Personnel Costs	0.00
2. Materials Costs	0.00